(12) UK Patent Application (19) GB (11) 2 055 543 A

(21) Application No **8003011**
(22) Date of filing **29 Jan 1980**
(30) Priority data
(31) **66866**
(32) **15 Aug 1979**
(33) **United States of America (US)**
(43) Application published **11 Mar 1981**
(51) **INT CL³**
A01J 5/04
(52) Domestic classification
A1M BA
(56) Documents cited
GB 1525741
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GB 1396429
GB 1383038
GB 1160900
GB 1160899
GB 1160898
GB 1106624
GB 1044491
GB 1025458
(58) Field of search
A1M

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(54) **Milker**

(57) An independent quarter milker has four teat cups with individual conduits 12, 14, 24 connected from the teat cups to a manifold 25 mounted on the stall structure. Milk from the manifold flows through a pipeline 27 to a collection tank. A flow sensor and shutoff valve in each milk conduit adjacent the manifold provides individual quarter milking control remote from the teat cups. A container 13 may be provided and has four separate chambers each connected in an individual conduit.

FIG. 1

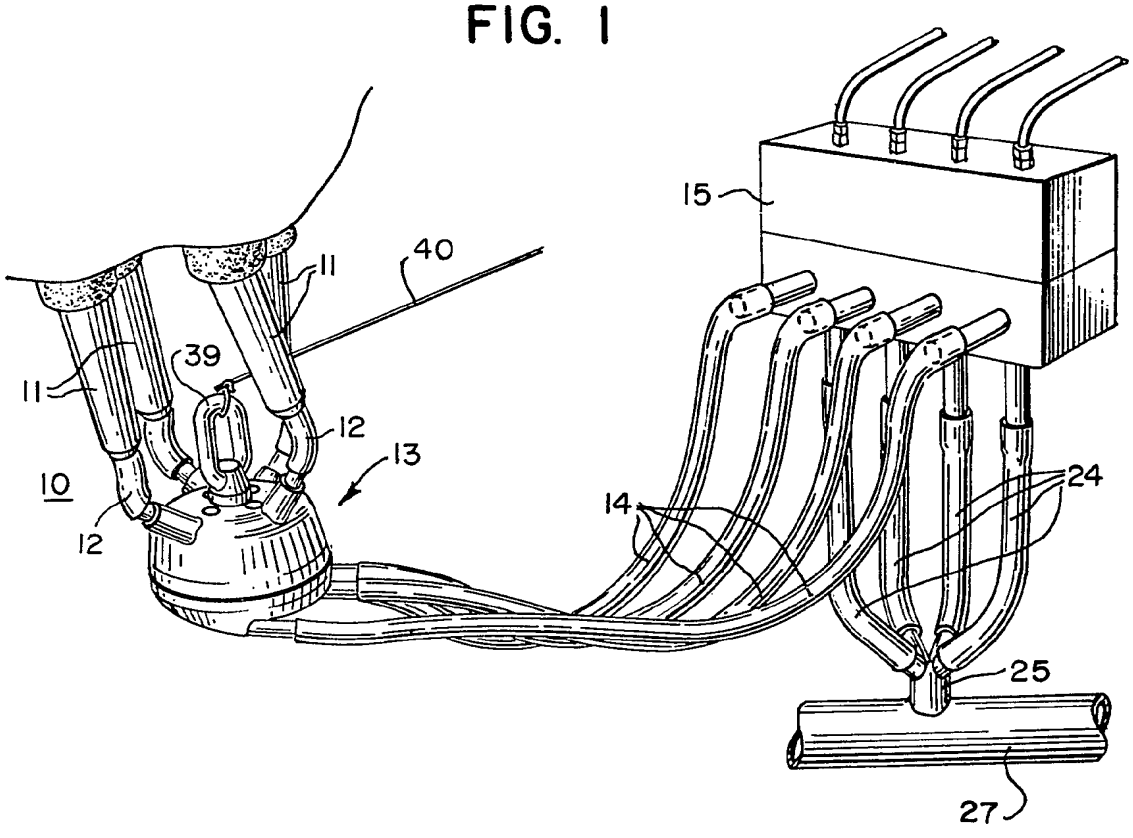

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FIG. 1

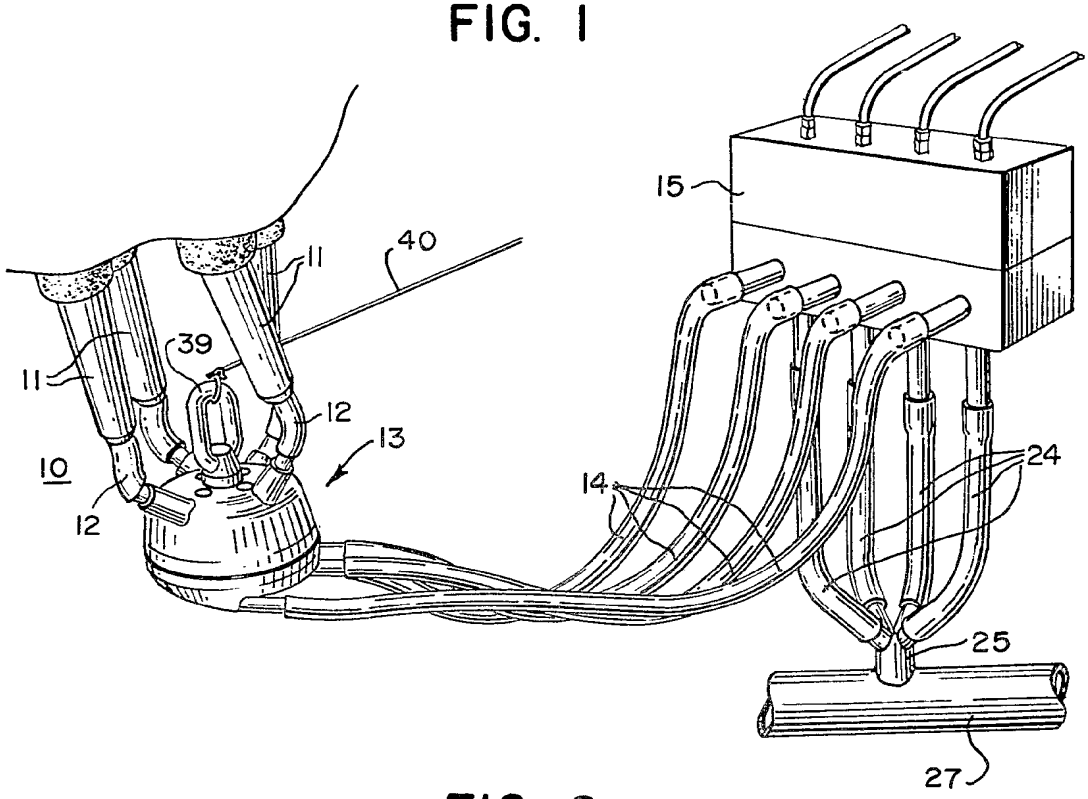
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FIG. 2

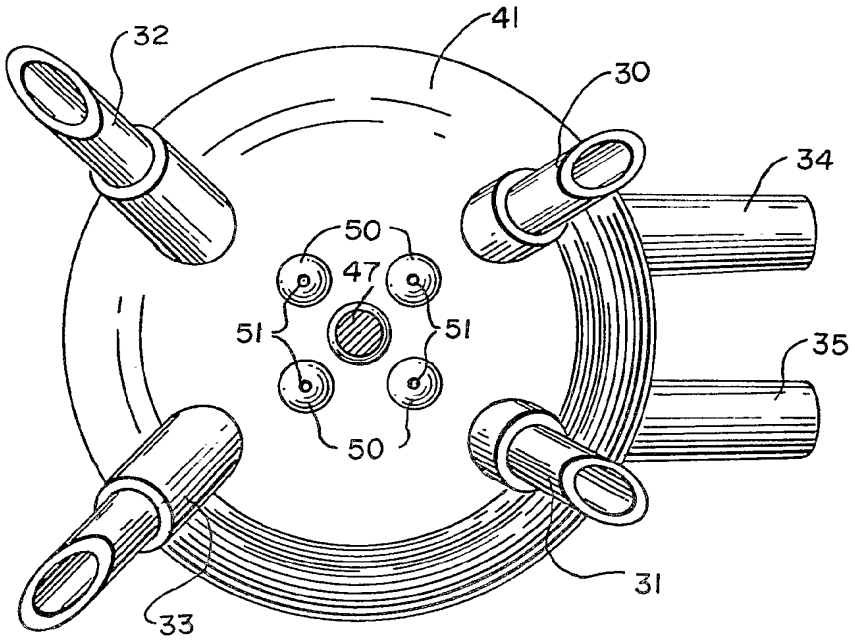
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FIG. 3

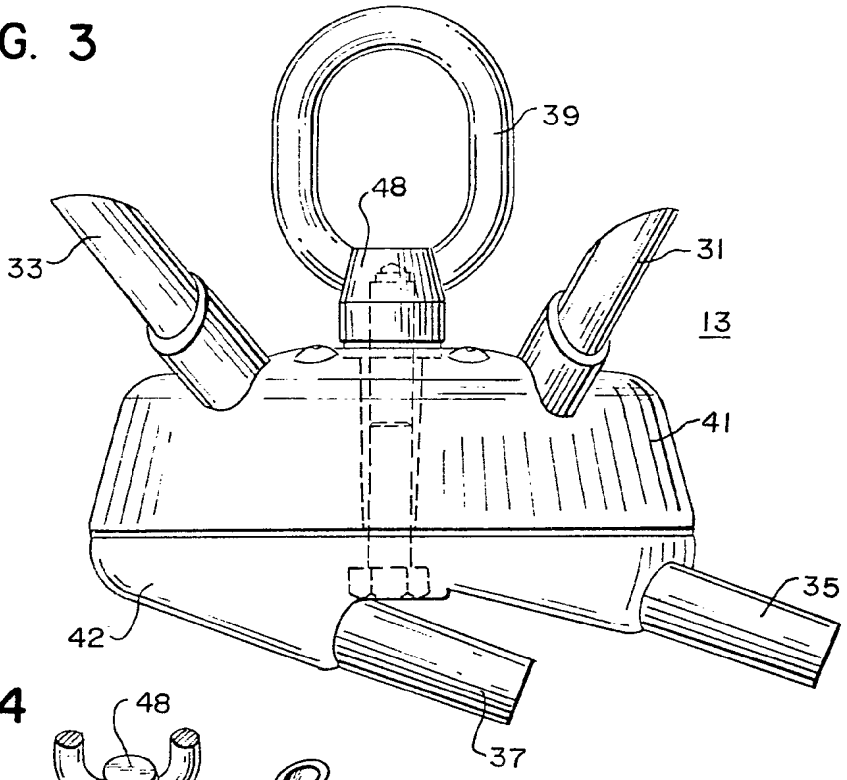


FIG. 4

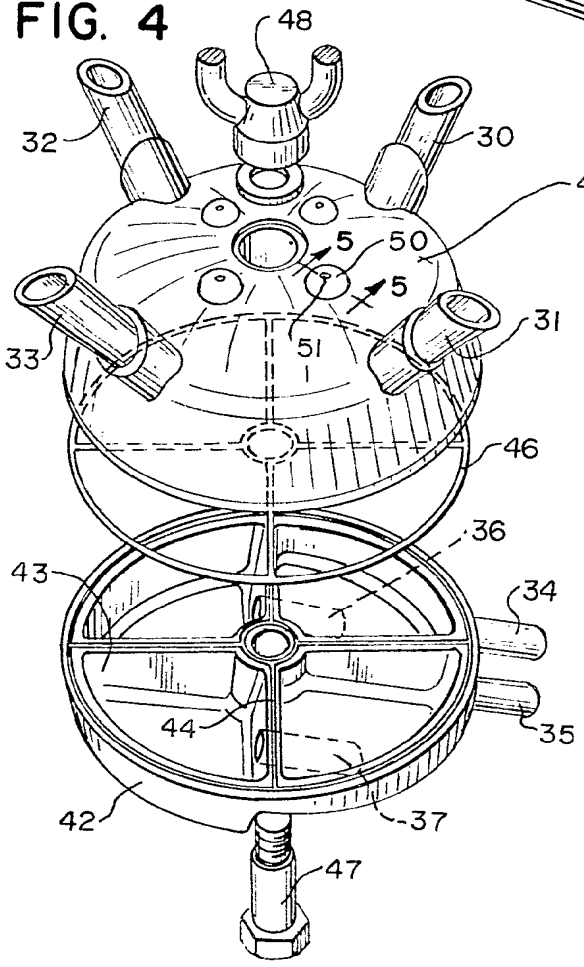


FIG. 5

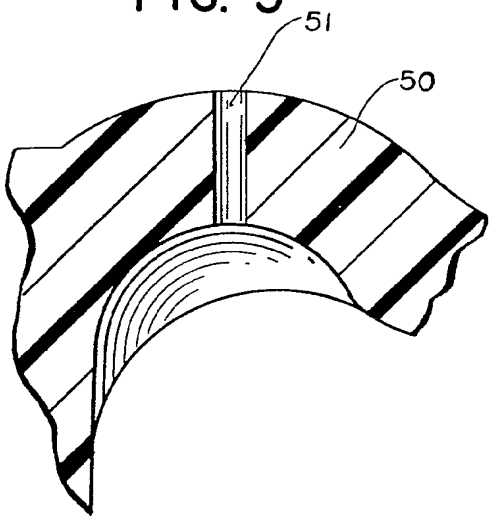


FIG. 7

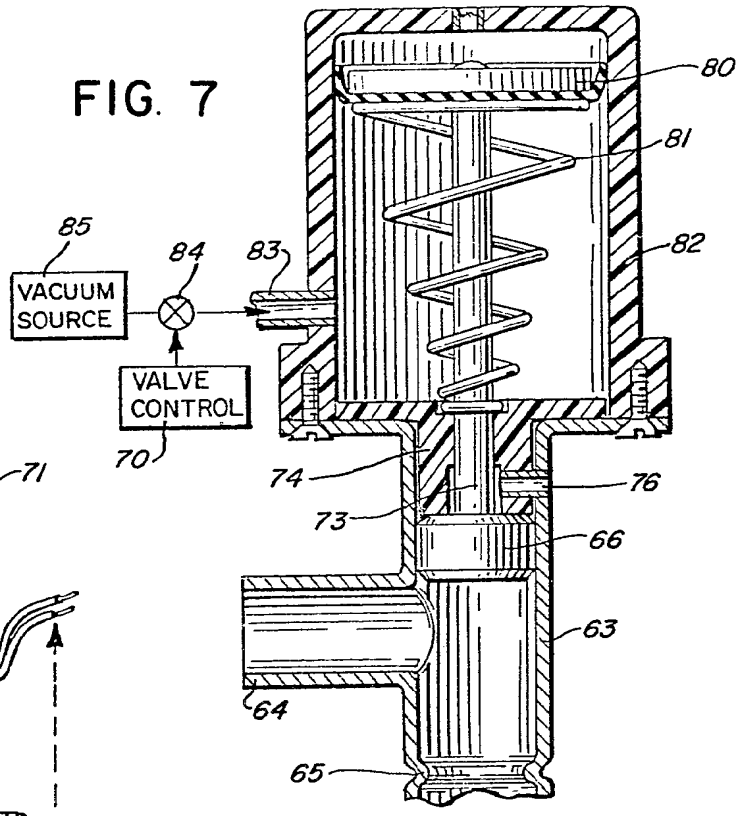


FIG. 6

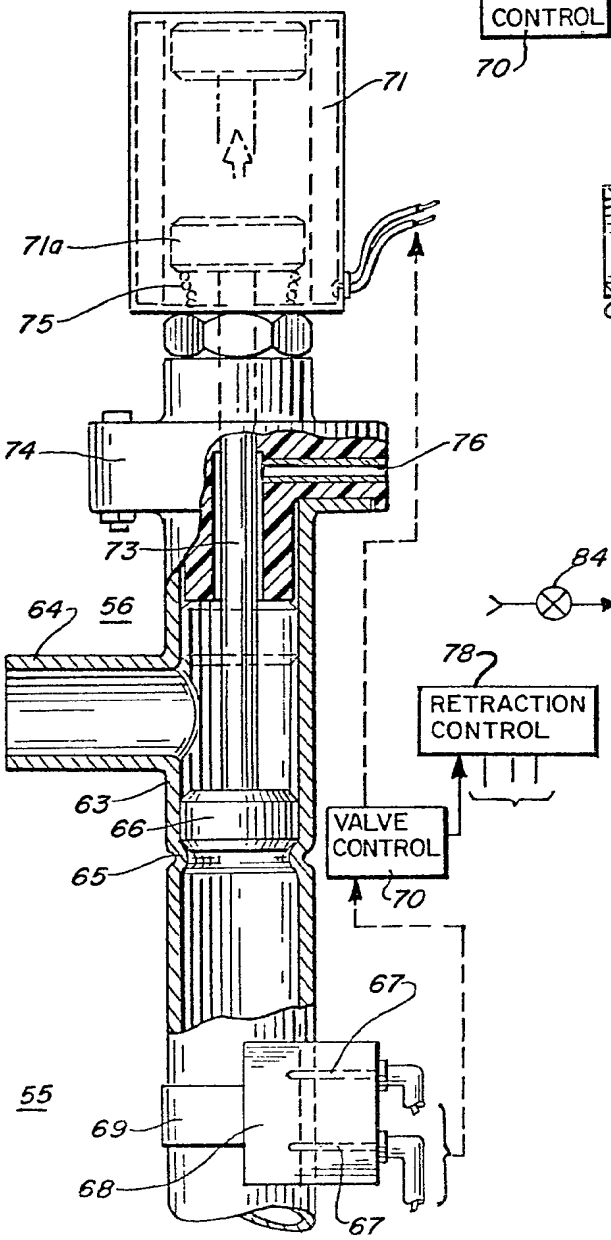
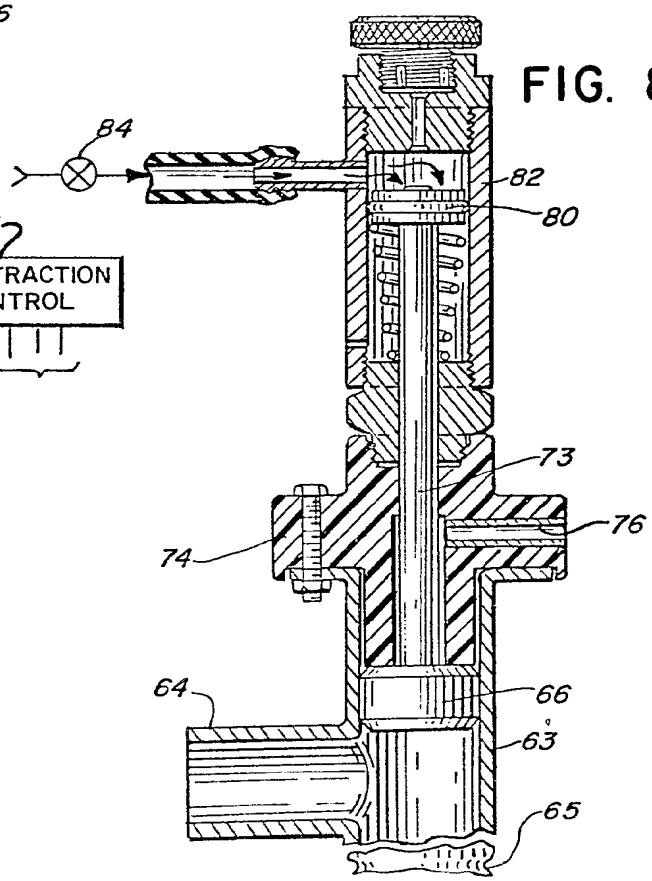


FIG. 8



SPECIFICATION

Milker

This invention relates to a milking apparatus with independent milk conduits connecting each teat cup with a carry-away milk pipeline or the like.

A typical milker has a receiver or claw to which the teat cups are connected. A hose connects the claw with a pipeline through which the milk is directed to a holding tank. The milk from the four quarters mixes in the claw and if one is infected, all of the milk from that cow must be collected and discarded. Moreover, in many such milkers, milk from one quarter may be drawn back into the teat cups of the other quarters. When one quarter is infected, there is a danger of cross infection of the other quarters.

In a milker having selective quarter shutoff valves, milk flow sensors and valve actuators must be incorporated in the receiver adjacent the teat cups. The flow sensing and shutoff mechanisms are subject to damage as by being kicked by the cow and exposed to water, urine and high humidity. The physical abuse and adverse operating conditions present maintenance problems which are particularly serious with a takeoff milker having electrical milk flow sensing, as electrical connections are required to the milking apparatus, adjacent the cow's udder. If the circuits are not well designed, constructed and maintained, they will not function reliably.

In accordance with one aspect of the invention, the milker comprises four double action teat cups and four separate milk conduits connected between the teat cups and a milk delivery point or manifold.

Another feature of the invention is that the manifold is spaced from the cow and teat cups and is preferably mounted on the stall structure.

A further feature is that a quarter shutoff valve and a flow sensor are provided in each milk conduit, remote from the teat cups and cow, to control the milking of each quarter but without subjecting the flow sensors and shutoff valves to the severe environment of the teat cups and milk receiver.

Fig. 1 is a diagrammatic illustration of a form of the invention;

Fig. 2 is a plan view of the milk receiver of Fig. 1;

Fig. 3 is a side elevation of the milk receiver of Fig. 1;

Fig. 4 is an exploded illustration of the milk receiver of Fig. 1;

Fig. 5 is a fragmentary enlarged section taken along line 5–5 of Fig. 4;

Fig. 6 is an enlarged fragmentary section through a quarter shutoff valve with electric flow sensing and an electric valve operator;

Fig. 7 is a fragmentary section of a quarter control valve with vacuum operation; and

Fig. 8 is a fragmentary section of a quarter control valve with air operation.

The milking system disclosed herein is particularly suited for use in a parlor milking installation where successive cows come to and are held in a stall during milking. This is to be contrasted with a stanchion installation where the cows are secured in stanchions and the milking apparatus is moved from cow to cow by an operator.

Milker unit 10, Fig. 1, has four teat cups 11 each of which includes a rigid shell with a flexible liner or inflation having a stem portion 12. Each of the inflation stems is connected with an intermediate receiver 13 having four separate chambers, described in detail below. Separate milk conduits 14 connect each of the chambers with an assembly of shutoff valves 15 which may include milk for sensors, mounted on a member of the stall (not shown). Short connectors 24 direct the milk to a manifold 25 and through pipeline 27 to a tank, not shown. A mastitis detector may be interposed in conduits 24 to identify an infection in one of the quarters of the cow. Milk flow signals may be provided by the mastitis detector to actuate the individual valves of valve assembly 15 eliminating the need for other flow sensors. The milk from the four quarters does not mix until it reaches manifold 25. The milk from one quarter cannot be drawn back into another teat cup, and the possibility of cross infection is eliminated.

Milk conduits 14 are preferably of flexible material, as plastic or rubber composition hoses, to accommodate movement of the cow during milking and to facilitate retraction of the milking apparatus from its position under the cow when the milking operation is completed. Straps, not shown, may hold the hoses 14 in a bundle for ease in handling. Alternatively, a single extrusion with four flow passages may be used. Receiver 13, quarter shutoff valves 15, manifold 25 and pipeline 27 are preferably of stainless steel or of a rigid plastic. The connector 24 may also be of stainless steel or may be rubber or plastic tubing to facilitate assembly of the parts.

In a typical double action milking system, carry-away pipeline 27 is evacuated and through the various interconnections a continuous vacuum is maintained in the interior of the flexible inflations. The space between each teat cup shell and the inflation is alternately evacuated and vented to atmosphere so that the inflations open and close. Alternate vacuum and air from a pulsation control (not shown) is connected with the teat cup shells.

The chambers of receiver 13 each have a capacity sufficient to hold at least the quantity of milk given by a single quarter in one pulsation so that the milk separates from the inflation stem and is not drawn back around the teat when the inflation expands. A chamber with a volume of one-half pint has been found satisfactory.

The intermediate milk receiver 13 is of a moldable, high temperature plastic, as polysulfone. This construction is preferable to stainless steel where the volume of milkers manufactured warrants the investment in molding dies. The plastic receiver is lighter than stainless steel, less expensive to manufacture in quantity and can be transparent so that milk flow may be observed by the operator.

The intermediate milk receiver has four inlet nipples, 30, 31, 32, 33, extending from the top, to which are connected the milk tubes 12 of the teat cups 11. Four outlet nipples 34, 35, 36 and 37 extend from the bottom of the receiver and have the milk conduits 14 connected thereto. A ring 39 extending upwardly

from a central location on top of the milk receiver has the lanyard 40 of a retraction mechanism (not shown) connected thereto. The retraction mechanism, as is known, can be actuated at the end of the milking operation to withdraw the milker from under the cow.

Milk receiver 13 is divided along a generally horizontal plane into a top section 41 and a bottom section 42. As best seen in Fig. 4, diametrically extending interior walls 43 and 44 divide the interior of the receiver into four chambers. The walls shown are in bottom section 42. Similar walls are provided in top section 41. The joint between the sections is sealed by a gasket 46. The sections are held together by a bolt 47 which is threaded into a socket 48 at the base of ring 39.

For convenience of reference, the side of the milk receiver which faces the head of the cow will be designated the front and the side of the receiver which faces the tail of the cow will be designated the rear. Interior wall 43 extends along the longitudinal axis of the receiver from the front to the rear. Wall 44 extends at right angles thereto, generally transversely of the receiver. Top section 41 is dome shaped with the inlet nipples 30-33 extending upwardly and outwardly from each chamber so that the teat cups 11 are appropriately located for attachment to the cow's teats. Nipples 30 and 31 at the front of the receiver extend upwardly from the central dividing plane of the receiver at an angle of the order of 55° and outwardly from a plane parallel with the longitudinal axis of the receiver at an angle of the order of 30°. The nipples 32 and 33 have an angle of the order of 40° with a horizontal plane and of the order of 45° with a plane parallel with the longitudinal plane.

The lower wall of each chamber has a generally planar surface facing the front of the milker, and to which each outlet nipple is secured. For example, the lower portion of the intermediate wall 44 forms the planar surface for the two rear chambers of the milk receiver. The four outlet nipples extend forward, are generally parallel with each other and are inclined downwardly at an angle of the order of 20° from the low point of each chamber so that milk will readily drain therefrom.

The wall of the top section has, for each of the four chambers, an outward protrusion 50, Fig. 5. An air inlet opening 51 extends through the receiver wall at the protrusion. Both the outer and inner surfaces of the protrusion are smoothly curved and extend outwardly from the surrounding surface of the top section. The protrusion tends to inhibit the flow of liquid film across the surface to the air inlet opening. Milk on the inner surface of the receiver could dry and block the opening while liquid on the outer surface of the receiver could be drawn in through the air inlet opening and contaminate the milk.

A quarter flow sensor 55 and shutoff valve 56 are illustrated in Fig. 6. A tubular valve housing 63, preferably of stainless steel, has an inlet nipple 64 to which the individual quarter milk conduit 19 is connected. An inwardly extending rib 65, below nipple 64, provides the seat for shutoff valve 66.

Flow sensor electrodes 67 are mounted in a block 68 of insulating material secured to the valve housing by strap 69. Electrodes 67 extend into the housing and are contacted by the milk flowing therethrough. So long as milk flows, an electrical circuit is completed between the electrodes which are connected with a valve control circuit 70. The valve control circuit provides an operating signal to electrical valve actuator 71 causing the valve to close when milk flow ceases. Details of a suitable circuit may be found in Needham et al United States patent 3,773,016.

Valve 66 is mounted on a rod 73 which extends upwardly through a plastic fitting 74 into valve actuator 71. An armature 71a on the end of the rod is urged upwardly by a spring 75. When the valve actuator is not energized, the valve rod and valve are in their upper position, shown in broken lines. When milk flow ceases and the valve actuator is energized, armature 71a is drawn downwardly shutting valve 66 and closing off the vacuum applied to the teat cup. Air is admitted to the upper portion of the valve housing 63 through an inlet port 76 in plastic fitting 74, relieving the vacuum in the milk conduit 19 and in the interior of the teat cup inflation. This allows the teat cup to drop from the animal. Plastic fitting 74 has a tight fit with valve rod 73 above air inlet 76, sealing the valve from the actuator. Further, valve member 66 in its open position engages the bottom face of plastic fitting 74, restricting the air admitted through inlet 76.

The valve controls for each of the quarters are connected with a milker retraction control 78. When all of the valves are closed, the retraction control is actuated to withdraw the milker from beneath the cow. Suitable mechanisms for performing this function are known and it is not shown here.

Figs. 7 and 8 illustrate other actuators for the shutoff valve. Elements which are common in Figs. 6, 7 and 8 are identified with the same reference numerals and will not be described in detail. Fig. 7 shows a vacuum actuator. A piston 80 is secured to the end of the valve rod 73 and urged upwardly by spring 81. Cylinder 82 has an exhaust fitting 83 connected through a valve 84 with vacuum source 85. When milker valve control 70 determines that milk flow has ceased, valve 84 is opened and cylinder 82 is evacuated closing shutoff valve 66. In Fig. 8 a source of air pressure is connected through valves 84 with cylinder 82, driving piston 80 downwardly to close the shutoff valve 66.

The independent quarter milking system enables individual quarter control with the flow sensors and shutoff valves removed from their usual location beneath the cow. This reduces the exposure of the flow sensors and shutoff valves to damage, simplifies system design and enhances reliability. The problem of cross infection of quarters is eliminated and milk from an infected quarter is isolated and may readily be collected.

CLAIMS

1. An independent quarter milker comprising:

four double action teat cups, one for connection with each of a cow's teats;

four milk conduits, one connected with each teat cup to direct the milk to a delivery point spaced from

the cow, the milk from each quarter being isolated from the milk from the other quarters.

2. The milker of claim 1 in which the delivery point is an evacuated milk pipeline.

3. The milker of claim 2 for use in the stall of a milking parlor having said evacuated milk pipeline adjacent thereto, said four milk conduits extending from the teat cups to the milk pipeline.

4. The milker of claim 1 in which said milk conduits include flexible hoses.

5. The milker of claim 4 including means securing said flexible hoses together.

6. The milker of claim 1 for a system in which milk is delivered from the teat cup in intermittent pulses, the system including four chambers, one to which each teat cup is connected, each chamber having a capacity sufficient to hold a pulse of milk, and each milk conduit being connected from a chamber to said delivery point.

7. The milker of claim 6 including an intermediate milk receiver having said chambers, each chamber having an inlet nipple connected with a teat cup and an outlet nipple connected with one of said milk conduits.

8. A parlor milking installation of the milker of claim 1 with a stall structure for confining the cow during milking and in which a manifold to which said milk conduits are connected is mounted on the stall structure adjacent the cow.

9. The milker of claim 1 having:
a shutoff valve in each conduit;
means for sensing flow through each conduit; and
means for closing each shutoff valve in the absence of milk flow through the associated conduit.

10. The milker of claim 9 in which said flow sensing means measures the electrical current flow through milk in the conduit and the shutoff valves in each of said conduits are electrically actuated.

11. The milker of claim 9 in which said flow sensing means measures the electrical current flow through milk in the conduit and the shutoff valves in each of said conduits are air actuated.

12. The milker of claim 9 in which said flow sensing means measures the electrical current flow through milk in the conduit and the shutoff valves in each of said conduits are vacuum actuated.

13. The milker of claim 9 in which the shut-off valves in each conduit controls an air inlet to each teat cup, the air inlet being opened when the valve in the conduit is closed.

14. The milker of claim 9 including a milker retraction control responsive to the means for sensing milk flow through each of said conduits.

15. A parlor milking installation of the milker of claim 9 with a stall structure for confining the cow during milking and in which said shutoff valves, flow sensing means and valve closing means are mounted on the stall structure adjacent the cow.

16. The milker of claim 1 in which the milk from each quarter of a cow is delivered to a common point remote from the cow through independent conduits and having
an intermediate milk receiver with top and bottom walls, interposed between the teat cups and the conduits, having four separate chambers,
an inlet nipple extending from the top of each chamber for connection with a teat cup, and
an outlet nipple extending from the bottom of each chamber for connection with a milk conduit,
said inlet nipples diverging outwardly and upwardly from the top of the milk receiver and said outlet nipples all extending in generally the same direction from the bottom of the milk receiver.

17. The milk receiver of claim 16 having a top section and a bottom section, defined by a transverse plane through the receiver.

18. The intermediate milk receiver of claim 17 in which each of said top and bottom sections has interior walls which mate with the sections assembled to divide the receiver into four chambers.

19. The intermediate milk receiver of claim 16 having a central retaining bolt holding the two sections of the receiver together.

20. The milk receiver of claim 16 having an air inlet opening into each of the chambers.

21. The intermediate milk receiver of claim 20 in which the chambers each have a top wall with an outward protrusion having smoothly curved outer and inner surfaces, said air inlet opening extending through said wall at said protrusion.

22. The intermediate milk receiver of claim 16 in which there are two inlet nipples extending forwardly from said receiver and two inlet nipples extending rearwardly therefrom, the forward extending nipples having an angle with the horizontal of the order of 55° and an angle with the longitudinal plane of the milk receiver of the order of 30°, said two rearwardly extending nipples having an angle with the horizontal of 40° and an angle with the longitudinal plane of the order of 45°.

23. The intermediate milk receiver of claim 16 in which the bottom wall has a surface in each chamber which faces generally in the direction of the front of the milker and said outlet nipples extend from said surfaces.

Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1981.
Published at the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.